72-12

An Announcement of

Highway Safety Literature

... A Bi-Monthly Abstract Journal

HSL No. 72-12 June 23, 1972 HS-011 084 - HS-011 144, HS-600 776, HS-800 566, 568 - 569, 571 - 572, 615, 622, 627 - 629, 647, 649 - 651, 655, HS-810 194 - 195, HS-820 185

HSL No. 72-12
June 23, 1972

SPECIAL ANNOUNCEMENT
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THIS ISSUE CONTAINS:

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U.S. Department of Transportation / National Highway Traffic Safety Administration

U. S. SUPT. OF DOCS. [redacted]
[redacted]

. . . A Bi-Monthly Abstract Journal

Published twice-a-month by the National Highway Traffic Safety Administration,
Research Institute, Office of Accident Investigation and Data Analysis
Washington, D.C. 20590

INTRODUCTION

Publications such as journal articles, proceedings, and research reports announced in *Highway Safety Literature* include some of the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 72 designates the year and 1, 2, 3, etc. the individual issues. To aid the user in locating citations by the HS-number, the cover bears the inclusive entry number for each issue.

Entries in *HSL* are arranged according to the NHTSA Subject Category List shown in the Table of Contents. The list is a two-level arrangement consisting of five major subject fields subdivided into 59 subject groups. Documents related directly to the National Highway Traffic Safety Administration (NHTSA) are announced in a separate section headed NHTSA DOCUMENTS and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series). NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration. HS-800 000 series and HS-820 000 series are available for, purchase from NTIS or GPO (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category.

SAMPLE ENTRIES

Subject Category Array	
NHSB Accession no	HS-800 218 Fld. 5/21; 5/9
Title of document	AN INVESTIGATION OF USED CAR SAFETY STANDARDS--SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L
Personal author(s)	by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams
Corporate author	Operations Research, Inc.
Collation	
Publication date	1969 150p Contract FH-11-6921 Report no. ORI-TR-553-Vol-6; PB-190 523
Abstract	Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks.

Search terms; Wear; Trucks; Failures; Used cars; Inspection standards

AVAILABILITY: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT–THE PROBLEM AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation .... Published in *FBI Law Enforcement Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the auto theft problem and comments on anti-theft devices available now or in the planning stage.

Search terms: Theft; Theft protection; Stolen cars

(Note: If the date of a report or Journal article is not given, the small letters nd will appear)

[redacted]

[redacted]

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NOTE: Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brand names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval of any particular product, course, or equipment by the U.S. Department of Transportation, National Highway Traffic Safety Administration.

Harry A. Feinberg
Managing Editor

AVAILABILITY OF DOCUMENTS AND INSTRUCTIONS FOR ORDERING

Articles and reports whose citations and abstracts appear in HSL are acquired from many sources, such as periodicals, journals, NHTSA Contractors' reports and NHTSA staff speeches, and other reports. Those reports other than NHTSA Contractors' reports and NHTSA generated reports and speeches (see introduction) are assigned a lower consecutive accession (HS-) number.

Department of Transportation personnel may borrow copies of publications announced in HSL from the NHTSA Technical Reference Division. Non-DOT Personnel, in the Washington, D.C. area, may borrow copies of publications for a 24-hour period only. Telephone (202) 426-2768. Government personnel in the Washington, D.C. area, use government ID phone 118-62768.

The names of the journals cited in HSL appear in *italic type* preceded by the words "Published in." The journal containing the article cited may be borrowed from most research and public libraries. Non-DOT personnel outside the Washington area should contact their company or agency libraries for assistance.

NHTSA Contractors' reports and other reports can usually be obtained as indicated under AVAILABILITY. However, there is no certainty that copies will be available for more than a limited period after a report is issued.

The more common availability sources are identified by symbols which are explained in the next column:

NTIS: National Technical Information Service, Springfield, Va. 22151. Order by accession number: HS, AD, or PB. Prepayment is required by NTIS coupon, check or money order (made payable to NTIS). GPO coupons are not acceptable. Documents are available in paper copy (PC); in full size original or reduced facsimile, and on microfiche (MF) a 4x6" negative sheet of film (reader required).

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Give corporate author, title, personal author, and report number. Prepayment is required by GPO coupon (NTIS coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

NHTSA: National Highway Traffic Safety Administration, General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874), Give HS-No.

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report numbers. Prices given are list; discounts are available to SAE members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders received without payment are subject to a $1 handling charge.

IMPORTANT NOTICE

WHEN REQUESTING a document, to be absolutely sure you receive what you order, give the accession number (HS, PB, AD number) or report number (in cases such as an SAE document), title of report, and the personal or corporate author (whichever is cited). When requesting an HS-numbered document from NTIS, add DOT/to the prefix HS-; example HS-800 000 should be ordered as DOT/HS-800 000.

1/0 ACCIDENTS

1/2 Injuries

HS-011 084 Fld. 1/2

INFECTIONS ENCOUNTERED IN TORNADO AND AUTOMOBILE ACCIDENT VICTIMS

by John H. Ivy

Published in *Journal of the Indiana State Medical Association* v61 p1657-61 (Dec 1968)

11refs

The frequency of clinically infected wounds among 94 victims of a tornado greatly exceeded those among 178 victims of automobile accidents which occurred during the same year. The incidence of enterobacteria in clinically infected wounds was 66% in tornado victims and 58% in automobile accident victims. Bacterial culture and antibiotic sensitivity determinations are an important adjuct in the proper treatment of contaminated wounds.

Search terms: Antibiotics; Injury research; Injury factors; Fungi; Bacteria; Medical treatment

HS-011 085 Fld. 1/2; 1/5

FATAL ACCIDENTS ON COMPLETED SECTIONS OF THE INTERSTATE HIGHWAY SYSTEM, 1968-70

by Harold R. Hosea

Published in *Public Roads* v36 n10 p219-21, 227 (Oct 1971)

6refs

This study identifies substantial changes which occurred during a three-year period. Two-thirds of all fatal accidents involved only one vehicle which was moving. The most common type of accident is the single vehicle which runs off the road; this type decreased slightly during the study period. Pedestrian accidents rose slightly. The most common type of accident involving two moving vehicles is the rear end collision. Rear end and sideswipe accidents declined slightly, while head on collisions rose. Other factors discussed are day and time of accident, weather, accident responsibility by type of vehicle, sex and age of drivers, drinking drivers.

Search terms: Accident location; Fatalities; Interstate Highway System; Accident rates; Accident types; Accident statistics; Accident studies; Single vehicle accidents; Ran off road accidents; Rear end collisions; Head on collisions; Side impact collisions; Sex factor in accidents; Pedestrian accidents; Time of accidents; Environmental factors; Accident responsibility; Day of week; Driver sex; Driver age; Drinking drivers; Driver intoxication; Vehicle characteristics; Age factor in accidents

1/3 Investigation

HS-011 086 Fld. 1/3; 3/3; 5/3

AN INVESTIGATION OF RIDER, BICYCLE AND ENVIRONMENTAL VARIABLES IN URBAN BICYCLE COLLISIONS

by E. Brezina; M. Kramer

Ontario Dept. of Transport (Canada)

1970 43p 8refs
Report no. TB-SE-70-01

Accidents involving child bicyclists in Toronto were studied. The study samples consisted of 275 bicyclists in reportable accidents and a random group of 1,062 school-age male bicycle owners. Factors relating to the bicyclist's comprehension of risk inherent in roadway environments, prediction of traffic movement, and control of the bicycle were identified. It was found that the accident-involved rider responded only to immediate and obvious traffic conflicts. Most accidents occurred during rush hours and many related to poor envirionmental conditions. Bicycles too large for the child also increased risk. It was concluded that humane and realistic integration of the child bicyclist as a road user requires recognition of his special problems and inexperience.

Search terms: Bicycle accidents; Bicycle characteristics; Bicycle handling; Bicycle rider age; Bicycle rider behavior; Accident risks; Children; Time of accidents; Environmental factors; Bicycle rider injuries; Accident risk forecasting; Vehicle bicycle collisions; Males; Toronto; Variables

HS-011 087 Fld. 1/3

HIGHWAY ACCIDENT REPORT. INTERSTATE BUS-AUTOMOBILE COLLISION, INTERSTATE ROUTE 15, BAKER, CALIFORNIA, MARCH 7, 1968

National Transp. Safety Board

1968 78p
Report no. SS-H-3

A man driving under the influence of alcohol and carbon monoxide was traveling the wrong way when he collided with an interstate bus. Both vehicles were being driven at normal freeway crusing speed. The bus driver braked severely and steered toward the median in an unsuccessful attempt to avoid a collision. The auto driver also attempted evasive action. The bus overturned and was gutted by fire, killing 19 of the 30 passengers and injuring the 11 survivors, some severely. The auto driver was killed instantly and ejected. Rapid propagation of the fire and inaccessibility of escape facilities gave the passengers in the middle of the bus little chance to survive. The fire was caused by power steering oil being discharged under high pressure from a broken fitting, ignited by exposed electrical circuits.

1/3 Investigation (Cont'd.)

HS-011 087 (Cont'd.)

Search terms: Drinking drivers; Driver intoxication; Carbon monoxide poisoning; Accident caused fires; Fatalities; Injuries; Accident severity; Injury severity; Driver emergency responses; Head on collisions; Wrong way driving; Freeways; Vehicle explosions; Vehicle vehicle collisions; Bus accidents; Rollover accidents; Escape from vehicle; Accident survivability

1/5 Statistical data

HS-011 088 Fld. 1/5; 1/3; 3/11

DIGEST OF DATA ON SCHOOL-AGE PEDESTRIAN ACCIDENTS OCCURRING ON COLORADO STATE HIGHWAYS (BASED ON A TEN-YEAR RECORD OF ACCIDENT EXPERIENCE FOR SCHOOL YEARS 1961-62 THROUGH 1970-1971)

Colorado Dept. of Highways

1970 18p

Accident tabulations for 1970-71 include location, severity, date, day, time, road condition and weather, traffic control, pedestrian age, and violations charged. A ten year summary indicates an average of about 30 accidents per year, a total of eight fatalities, and 310 injuries (of which 117 were major). Accidents usually occurred within a few blocks of the child's home, nearly half occurred while the pedestrian was jaywalking, usually on highways of more han two lanes, and about two-thirds nvolve pre-teenagers. Right of way and traffic signal violations by school-age pedestrians were three times as numerous as those by drivers. Approximately 63% of the pupils involved in accidents were boys. Signalized intersections were the scene of about one-third of the school-age pedestrian-vehicle conflicts, and about 11% of the pupil-vehicle conflicts occurred when roads were icy, snowy, or wet. Accident frequency was about equally divided between morning and afternoon hours.

Search terms: Colorado; Young pedestrians; Pedestrian accidents; Accident location; Accident severity; Injury severity; Accident statistics; Children; Fatalities; Injuries; Day of week; Time of accidents; Road conditions; Traffic law violators; Pedestrian age; Traffic law violations; Accident rates; Males; Traffic control; Weather

HS-011 089 Fld. 1/5; 3/3

BICYCLE RIDING AND ACCIDENTS AMONG YOUTHS. SUMMARY REPORT

by B. J. Campbell; J. P. Foley; E. A. Pascarella

North Carolina Univ. Hwy. Safety Res. Center

1971 25p

Condensed from *Characteristics of Youthful Bicycle Riders in an Urban Community and Events Accruing to Operation of Their Vehicles.*

A survey of bicycle riding and accidents in Raleigh, N. C., was conducted in 1970. Close monthly surveillance was maintained on a sample of about 500 youths regarding riding practices, mileage exposure, and accidents, including even minor mishaps requiring only first aid from a parent. Conclusions were: no type of bike has a higher accident or injury association than other types; younger riders have more accidents; safer bike design and educational programs may be desirable; mechanical problems have a role in accidents; and falls are the most frequent minor accidents.

Search terms: Accident rates; Bicycle accidents; Bicycle rider age; Accident risks; Accident rates; North Carolina; Accident statistics; Accident studies; Bicycle rider behavior; Bicycle characteristics; Accident severity; Age factor in accidents; Child safety education; Failure caused accidents; Accident causes; Falls; Bicycle safety; Bicycle rider injuries; Environmental factors; Driver mileage

2/0 HIGHWAY SAFETY

2/1 Breakaway Structures

HS-011 090 Fld. 2/1

THE DESIGN AND PERFORMANCE OF SAFER LUMINAIRE SUPPORTS

by Thomas C. Edwards

Published in *Highway Research Board Special Report* n107 p149-57 (1970)

9refs

Sponsored by Committee on Guardrail, Median Barriers and Sign, Signal and Lighting Supports.

Results of 31 full-scale collision tests are summarized. Tests are grouped according to the base concept employed: steel and aluminum flanged bases, steel and aluminum transformer bases, aluminum inserts, steel progressive shear bases, notched bolts, and slip bases. Statistics for a total of 185 luminaire-support accidents are presented. These data aid in establishing the effectiveness of breakaway concepts in reducing injuries. A mathematical model of the vehicle-luminaire support collision is used to extend the knowledge of vehicle and support response not covered by full-scale tests. Criteria for the design of safe luminaire supports are presented.

Search terms: Luminaires; Breakaway light poles; Impact tests; Materials tests; Vehicle light pole collisions; Accident statistics; Injury prevention; Mathematical models; Steels; Aluminum; Bolts; Impact forces; Head on collisions; Injury severity; Vehicle weight

HS-011 091 Fld. 2/1

DYNAMIC FIELD TEST OF WOODEN SIGNPOSTS

by Foster C. Sankey

Published in *Highway Research Board Special Report* n107 p158-68 (1970)

2refs

Sponsored by Committee on Guardrail, Median Barriers and Sign, Signal and Lighting Supports.

Ten tests of wooden signposts were made to determine their breakaway characteristics when various planes of weakness were introduced into the posts. The planes of weakness were different sizes of holes or notches. Dynamic tests to simulate automobile collisions were accomplished by towing the test vehicle to 40 mph and releasing it 100 feet prior to impact with the post. Test results indicate that holes are equivalent to notches for reducing the post section at the ground line, but the plane of weakness introduced under the sign did not function. Results also indicate that safety would be provided if signs were mounted with a clearance of 6 to 7 feet between ground line and sign bottom and if stronger bolts were used to connect the sign to the post. Posts with 4 by 4 inch cross sections do not require a plane of weakness.

Search terms: Wood; Materials tests; Performance tests; Dynamic tests; Impact tests; Breakaway sign supports; Bolt loads; Sign impact protection; Instrumented vehicles; Field tests

2/4 Design and Construction

HS-011 092 Fld. 2/4

THE MODULAR CRASH CUSHION—RESEARCH FINDINGS AND FIELD EXPERIENCE

by T. J. Hirsch; Don L. Ivey; Monroe C. White

Published in *Highway Research Board Special Report* n107 p140-8 (1970)

4refs

Sponsored by Committee on Guardrail, Median Barriers and Sign, Signal and Lighting Supports.

The modular crash cushion is an agreement of 55-gal tight-head barrels positioned to protect motorists from collision with rigid obstacles. Six full-scale vehicle crash tests are described; three head on, two at an impact angle of 30 degrees, and one at an angle of 20 degrees. The modular crash cushion was highly effective in stopping vehicles with acceptable levels of deceleration. Cushions have been installed at locations in Houston and Dallas. Five vehicles have collided with the cushions, with very minor damage to the vehicles. Only one of the five drivers received even minor injuries.

Search terms: Crash cushions; Vehicle fixed object collisions; Impact angle; Deceleration; Impact protection; Angle impact tests; Head on impact tests; Performance tests; Barrels

HS-011 093 Fld. 2/4

EXPERIENCE TO DATE WITH IMPACT ATTENUATORS

by John G. Viner

Published in *Public Roads* v36 n10 p209-18 (Oct 1971)

30refs

About 20,000 people per year are killed in accidents in which their vehicles left the road. Such accidents are the leading source of fatalities on interstate and other freeways. In more than 40% of interstate fatal accidents, the vehicles struck rigid roadside obstacles. Among the efforts to reduce this toll has been development of impact attenuators, also called crash cushions and energy-absorbing barriers, at locations such as exit ramps on bridges.

Search terms: Impact attenuators; Crash cushions; Energy absorbing barriers; Ran off road accidents; Interstate Highway System; Vehicle fixed object collisions; Fatality prevention; Impact protection; Freeways; Impact forces; Deceleration; Impact severity; Impact protection

HS-011 094 Fld. 2/4; 4/3

STATISTICAL AND ECONOMIC ASPECTS OF RAIL-HIGHWAY GRADE CROSSING SAFETY IMPROVEMENT PROGRAMS IN TEXAS

by Hoy A. Richards; Jack T. Lamkin

Texas A and M Univ. Texas Transp. Inst.

1970 255p
Report no. RR-111-2

Sponsored by Texas Highway Department in cooperation with Federal Highway Administration.

Texas has about 14,000 railroad grade crossings at which some 800 accidents occur annually. The accidents result in approximately 100 deaths and 300 injuries per year. Costs of installing new warning devices would be more than $120 million. Complete grade separation would cost about $4.5 billion. A procedure for establishing priorities for grade crossing safety improvement is presented. It provides a framework for the construction of a ranking system or priority index for traffic intersections according to their relative attractiveness as investment alternatives.

Search terms: Railroad grade crossings; Accident location; Railroad grade crossing accidents; Priorities; Benefit cost analysis; Fatality rates; Injury rates; Warning systems; Vehicle train

2/4 Design and Construction (Cont'd.)

HS-011 094 (Cont'd.)

collisions; Accident rates; Accident factors; Accident studies; Flow charts; Accident risk forecasting; Decision making; Texas

HS-011 095 Fld. 2/4

ENGINEERING ASPECTS OF RAIL-HIGHWAY GRADE CROSSING SAFETY EVALUATION

by Neilon J. Rowan; Ned E. Walton

Texas A and M Univ. Texas Transp. Inst.

1970 84p
Report no. RR-111-3(F)

Sponsored by Texas Highway Department in cooperation with Federal Highway Administration.

The diagnostic study team concept was used at thirty-six rail-highway grade crossing sites in Texas as a part of an overall study on rail-highway grade crossing safety. The objective of the diagnostic study phase was to determine the type of protection that would provide acceptable efficiency under the conditions encountered on the various classifications of grade crossings. As a result of the investigations at the thirty-six crossings, recommendations were made for improving the safety conditions and included the development of new advance warning signs and sign location criteria. These signs were evaluated at nine crossing sites in a follow-up study. In addition, recommendations have been made for implementation of engineering and environmental studies to improve safety at specific grade crossings.

Search terms: Railroad grade crossings; Sign location; Warning signs; Sign standards; Sign design; Priorities; Accident prevention; Sign warrants; Texas; Accident location; Multidisciplinary teams; Warning systems; Accident risk forecasting; Data acquisition; Questionnaires

HS-011 096 Fld. 2/4

GUARDRAIL PERFORMANCE AND DESIGN

by Jarvis D. Michie; Lee R. Calcote; Maurice E. Bronstad

Southwest Res. Inst.

1971 81p 122refs
Report no. NCHRP-115

Sponsored by the American Association of State Highway Officials in cooperation with the Federal Highway Administration.

This report is recommended to highway design engineers, safety engineers, researchers working with traffic barrier systems, and others concerned with highway safety. It contains an overview of guardrail and median barrier technology, summarizes the results of 25 full-scale crash tests, and reports on the relative performance of the designs tested. Data are included on fatal single-vehicle accidents involving collisions with fixed objects. A six degree of freedom mathematical model was found useful in describing dynamic behavior of a vehicle during impact. The most significant factors in barrier performance are structural integrity in redirecting a vehicle; vehicle acceleration during redirection; and post-impact trajectory of the vehicle.

Search terms: State of the art studies; Guardrails; Median barriers; Guardrail design; Guardrail impact tests; Instrumented vehicles; Postcrash phase; Crash phase; Acceleration; Vehicle trajectories; Degrees of freedom; Mathematical models; Vehicle barrier collisions; Vehicle fixed object collisions; Fatalities; Accident statistics; Accident severity; Single vehicle accidents

AVAILABILITY: HRB $3.60

2/9 Traffic Control

HS-011 097 Fld. 2/9

A STUDY OF ROAD TRAFFIC CROSSING THE CORDONS ROUND THE CENTRAL AREAS OF EIGHT TOWNS WITH POPULATIONS RANGING FROM 18,000 TO 8 MILLION

by P. W. Munt; F. V. Webster

England Road Res. Lab.

1968 99p 7refs
Report no. RRL-LR-209

Traffic flows were surveyed during 1964-66 around London and smaller cities. Flows (classified by type of vehicle) were estimated from three minute sample counts taken every quarter-hour throughout the day from 7 a.m. to 7 p.m. (later in London) on all roads crossing the cordons, and some estimates of bus occupancy were also made. Peak period durations varied from an hour in the smaller towns to two hours in London; flows were about a third higher in the predominant direction and 60% higher than in daytime off-peak periods. Private transport provided three-fourths of person movements in smaller towns, and about one-third in larger provincial cities.

Search terms: Traffic surveys; Urban traffic flow; Great Britain; Commuting patterns; Peak hour traffic; Traffic volume; Traffic counts; Traffic data analysis; Traffic characteristics; Bus usage; Automobile urban usage; Commercial vehicles; Motorcycle usage; Taxicab usage; Travel time

HS-011 098 Fld. 2/9; 4/3

GUIDELINES FOR THE INCLUSION OF LEFT-TURN LANES AT RURAL HIGHWAY INTERSECTIONS. FINAL REPORT

by S. L. Ring; R. L. Carstens

Iowa State Univ.

1970 69p 23refs
Report no. ISU-ERI-AMES-82100; PB-195 726

Provision of left turn lanes is a major problem which lacks an objective approach. Various techniques and procedures in use have been reviewed. Traffic characteristics at typical Iowa intersections have been measured. A rational approach for inclusion of a left turn lane has been developed, based on relating the benefits to the road user to the cost of providing the added turning lane. An analysis of field data gathered under this project indicates that the use of theoretical distribution to describe vehicle headways is not applicable to rural Iowa two lane roads. As an alternate approach the mass of field data gathered were examined using multiple regression techniques to yield equations for predicting stops and delays. The benefit-cost ratio technique is recommended as the criterion for decision making.

Search terms: Benefit cost analysis; Left turn lanes; Rural highways; Two lane roads; Iowa; Traffic characteristics; Intersections; Headways; Regression analysis; Waiting time; Stopping time; Accident risk forecasting; Traffic volume; Accident location; Gap acceptance; Vehicle operating costs; Accident costs; Highway costs; Decision making

AVAILABILITY: NTIS as PB-195 726

3/0 HUMAN FACTORS

HS-011 099 Fld. 3/0; 2/0

WESTERN STATES MILITARY-CIVILIAN TRAFFIC SAFETY CONFERENCE, 1-2 MAY 1964, PRESIDIO OF SAN FRANCISCO, CALIFORNIA. FINAL REPORT

Army (6th);

1964 140p

The 1964 conference theme was Improving Driver Performance–Key to Traffic Accident Prevention. Military and civilian officials met in workshops and general sessions, preparing recommendations for attacking problems discussed. Workshop subjects were: enforcement, judiciary and legal aspects, engineering, education and driver improvement, medical factors, psychological factors, sociological factors, motor vehicle administration, public information, and senior commanders. Recommendations resulting from each workshop are given.

Search terms: Highway safety programs; Driver attitudes; Driver education; Legal factors; Driver licensing; Driver motivation; Driver performance; State motor vehicle departments; Accident causes; Accident prevention; Problem drivers; Public relations; Traffic law enforcement; State action; Medical factors

3/1 Alcohol

HS-011 100 Fld. 3/1

VEHICLE COUNTERMEASURES FOR INTOXICATED DRIVERS

by Trevor Owen Jones

General Motors Corp.

1972 17p 21refs
Report no. SAE-720136

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This paper is an expansion of a previously presented paper "Ignition Interlocks for Intoxicated Drivers" with additional data analysis which exposed the basic problems resulting from the operation of automobiles by intoxicated drivers in the United States. Several approaches to the development of ignition interlock systems are discussed. The Phystester, an ignition interlock developed by General Motors and based on a pre-driving performance test of short duration, is discussed. Plans for evaluation of its effectiveness are presented, and available data from experiments involving both sober and intoxicated subjects are included. Integration of the Phystester in the operation of the vehicle and additional functional uses of the device are also discussed. Results of the Michigan Breath Testing Program 1970-1971 are provided as an appendix.

Search terms: Driver intoxication; Drinking drivers; Problem drivers; Alcohol usage deterrents; Alcohol detection and interlock systems; Alcohol breath tests; Blood alcohol levels; Driver performance; Driving task analysis; Alcohol effects; Driver physiological test devices

AVAILABILITY: SAE

HS-011 101 Fld. 3/1

AUTOMATIC DETECTION OF INTOXICATED DRIVERS

by E. Donald Sussman; Philip W. Davis; Andrew Warner

Department of Transp., Transp. Systems Center

1972 8p
Report no. SAE-720138

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

As the evidence of the contribution of intoxicated drivers to vehicular fatalities continues to mount, interest has grown in the development of novel countermeasures. One approach now being considered involves the use of a device installed in the automobile which automatically determines if the driver is intoxicated and prevents the driver from operating the vehicle when intoxication is determined. In this paper such devices are discussed with particular consideration given to the method of determining intoxication, the point in time when the

3/1 Alcohol (Cont'd.)

HS-011 101 (Cont'd.)

determination is made, and their applications. The paper also discusses the Transportation Systems Center's research program directed to dealing with this problem.

Search terms: Driver intoxication; Alcohol usage deterrents; Drinking drivers; Driver physiological test devices; Problem drivers; Driver performance; Alcohol detection and interlock systems

AVAILABILITY: SAE

HS-011 102 Fld. 3/1

THE SCANDINAVIAN APPROACH TO THE DRINKING DRIVER

by Marvin H. Wagner

Published in *Traffic Digest and Review* v17 n12 p7-11 (Dec 1969)

Public approval is basic to the severe drinking and driving laws and enforcement in Scandinavia. License suspension and prison terms are common penalties—and in Sweden—loss of insurance protection while intoxicated. Warning labels are also being used on drugs inducing hazardous conditions for driving. Whether similar laws are possible in the United States is uncertain, but recommended are: insurance subrogation against intoxicated driving, shorter but mandatory jail terms, blood alcohol limit of 0.08 percent, longer license revocation, alcoholism research, and public educational campaigns.

Search terms: Alcohol laws; Alcohol usage deterrents; Drinking drivers; Driver license revocation; Public opinion; Scandinavia; Drug effects; Blood alcohol levels; Driver intoxication

HS-011 104 Fld. 3/1; 3/4

ALCOHOL LEVEL AND DRIVING PERFORMANCE. FINAL REPORT

by Harry W. Case; Slade Hulbert; Herbert A. Moskowitz

California Univ. ITTE

1971 68p 36refs

Report no. PB-201 060; UCLA-ENG-71-17

Supported in part by California Business and Transportation Agency in cooperation with the Federal Highway Administration.

Simulated driving under alcohol ingestion and under control conditions was compared. Insensitivity of standard dependent measures led to additional studies of a subsidiary task technique to be used in simulation studies to increase measurement sensitivity. A time-sharing or divided attention task was developed which effectively increased driver information processing load. The rationale for use of this subsidiary-task technique is discussed and the simulator facility described.

Search terms: Blood alcohol levels; Alcohol effects; Driver performance; Driving simulation; Driving tasks; Loading (operator performance); Male drivers; Young adult drivers; Adult drivers; Design of experiments

AVAILABILITY: NTIS $3.00

3/4 Driver Behavior

HS-011 103 Fld. 3/4

A MOVING-BASE CAR-FOLLOWING AUTOMOBILE SIMULATOR

by James H. Ott; Franklin B. S. Shah; Robert E. Fenton

Published in *IEEE Transactions on Vehicular Technology* vVT-19 n4 p238-45 (Nov 1970)

18refs

Sponsored by Ohio Department of Highways and Bureau of Public Roads.

A moving-base car following simulator was designed and constructed for studying the driver-vehicle system under various simulated highway conditions. The four primary components of the simulator are a moving-base cockpit, a model lead car on a variable-speed treadmill on which a two-lane road is continuously positioned, a closed-circuit television system, and a laboratory analog computer. Results obtained from the simulator closely approximate results from experiments on the highway, but the simulator has disadvantages which limit the range of its applications.

Search terms: Driving simulators; Car following; Two lane roads; Closed circuit television; Analog computers; Laboratory tests; Driver vehicle interface; Computerized simulation; Vehicle dynamics; Mathematical models; Driving task analysis; Road tests

HS-011 105 Fld. 3/4

PHYSIOLOGICAL AND RESPONSE MEASUREMENTS IN DRIVING TASKS

by David H. Weir; R. Wade Allen

Systems Technology, Inc.

1972 7p 8refs
Report no. SAE-720139

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Driver response and performance can be quantified by observing the stimulus-response environment. Yet the driver's inherent adaptability allows him to have seemingly adequate performance in potentially hazardous driving situations even though he may be operating near the acceptable safety limits. Physiological measures of the driver's internal state can provide further quantification of his performance level and can give a measure of his workload or safety performance margin. Measures of driver physiological and control responses have been made under gust disturbance conditions with the subject's car operating at various speeds. The experimental techniques and data are described, and correlations between the situational parameters and driver stress and control response are shown.

> Search terms: Driver physiological test devices; Driver performance under stress; Driving task analysis; Driver vehicle interface; Vehicle control; Driving conditions; Hazard perception; Driver skills; Driver tests; Perceptual loads; Wind forces; Heart rate; Electrocardiograms

AVAILABILITY: SAE

HS-011 106 Fld. 3/4

HEART RATE VARIABILITY: A NEW INDEX OF DRIVER ALERTNESS/FATIGUE

by James F. O'Hanlon

Human Factors Research, Inc.

1972 8p 10refs
Report no. SAE-720141

> Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This was an investigation of the relationship between heart rate variability (HRV) and driver performance, and a preliminary test of an Experimental Alertness Indicator (EAI) a device for measuring HRV. Three drivers drove on a round-the-clock basis for 5 days over a 364 mile (586 km) circuit on a California highway. HRV and driver error frequency were recorded and analyzed to determine effects of driving time, rest breaks, traffic event frequency, and other variables. The results showed that HRV increased markedly with driving time, HRV recovered after rest, HRV might have reflected features of the highway's geometric configuration, HRV dropped substantially after the occurrence of events which realerted the drivers, and HRV was little influenced by traffic event frequency per se. It was concluded that HRV is related to driver alertness/fatigue and that the EAI has promise of being useful for estimating the level of driver alertness.

> Search terms: Driver fatigue; Driver performance; Heart rate; Driving conditions; Driver performance under stress; Driver mileage; Rest pauses; Driver errors; Driver evaluation devices; Driver physiological test devices; Travel time; Trip length; Attention; Traffic characteristics; Instrumented vehicles; Driver monitoring; Highway characteristics

AVAILABILITY: SAE

HS-011 107 Fld. 3/4

THE EFFECT OF STRESS ON DRIVER INFORMATION SEEKING

by George L. Smith, Jr.

Ohio State Univ.

1972 6p 11refs
Report no. SAE-720143

> Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This paper reviews research done by the Systems Research Group at The Ohio State University on the information-seeking behavior of automobile drivers. The effect of sleep deprivation, long-term driving, and low levels of alcohol intoxication on driver eye-movement patterns is discussed. The adaptive behavior which results from loss of peripheral information processing capability under stress is manifested through wider dispersion and less preview by the tired drivers and tunnel vision by the intoxicated drivers. The loss of this information can be expected to result in unsafe performance.

> Search terms: Driver performance under stress; Drinking drivers; Eye movements; Information seeking; Driver fatigue; Sleep deprivation; Driver intoxication; Tunnel vision; Travel time; Trip length; Driver mileage; Alcohol effects; Driving task analysis

AVAILABILITY: SAE

3/5 Driver Education

HS-011 108 Fld. 3/5; 4/2

ADULT DRIVER EDUCATION STANDARDS

by Richard Kaywood

Published in *Analogy* n9 p18-20

> Excerpts from a presentation at the National Safety Congress, 27 Oct 1969.

After a questionnaire to California schools revealed the diversity of adult driver-education courses, a state-wide conference developed standards and published guidelines: Programs comparable to the best high school programs were recommended. Community relations, financing, facilities and equipment, and teacher training, supervision, and evaluation were among problems considered.

> Search terms: Driver education standards; Adults; California; State action; Conferences

3/12 Vision

HS-011 109 Fld. 3/12

DRIVER'S VISUAL RANGE DETECTION

by R. S. Frenk; D. E. Skaar; J. A. Tennant

General Motors Corp.

1972 17p 9refs
Report no. SAE-720142

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This paper presents the results of a study to determine the factors required to monitor visual range. Equations are presented that indicate that it is possible to monitor visual range by using measurements of scene luminance, atmospheric backscatter, and ambient light levels. The concept of a device that could monitor a driver's visual range using these measurements is also described. Visual range is the distance at which a hazard can be detected.

Search terms: Driver monitoring; Hazard perception; Sight distances; Visibility; Coefficient of friction; Driver reaction time; Stopping distance; Luminance; Brightness; Contrast; Light conditions; Target detection; Night driving; Environmental factors; Optical detectors; Mathematical models

AVAILABILITY: SAE

5/0 VEHICLE SAFETY

5/4 Design

HS-011 110 Fld. 5/4; 4/7

FLUIDICS

Society of Automotive Engineers, Inc.

1969 55p refs
Report no. SAE-SP-348

Includes HS-011 111, HS-011 112, and HS-011 113

Seven papers concern theory and hardware of fluidics, the field of control devices and systems based on moving fluids and utilizing few or no other moving parts; a plea for industrial cooperation on fluidics research data, introduction to design and steady-state characteristics of control and logic devices, network design and performance, admittance properties of a jet proportional amplifier, review of European devices and applications, vortex value servoactuator for helicopter control, and operation and reliability of fluidic systems are presented.

Search terms: Fluidics; State of the art studies; Conference programs; Systems engineering; Control equipment; Hydraulic equipment; Pneumatic equipment; Europe; Digital computers; Jet amplifiers; Servomechanisms; Reliability; Logic devices

AVAILABILITY: SAE

HS-011 111 Fld. 5/4

FLUIDIC DEVICES AND THEIR STEADY-STATE CHARACTERISTICS

by Karl N. Reid

Oklahoma State Univ.

Published in HS-011 110, *Fluidics* (SP-348), New York, 1969 p2-10

9refs
Report no. SAE-690533

This paper provides an introduction to fluidic control and logic devices and their steady-state characteristics. Fluidic devices have high reliability in adverse environments, simplicity and low cost. Basic flow mechanisms are discussed in relation to their exploitation in the fluidic implementation of various control and logic functions. Tables are presented which summarize the basic flow modulation and digital logic devices, including their describing symbology.

Search terms: Fluidics; Control equipment; Symbols; Logic devices; Fluid flow; Jet amplifiers; Modulators

HS-011 112 Fld. 5/4

INTRODUCTION TO FLUIDIC NETWORKS

by W. F. Datwyler; R. W. Young; C. J. Ahern

Bendix Corp.

Published in HS-011 110, *Fluidics* (SP-348), New York, 1969 p11-26

Report no. SAE-690532

This paper describes a number of basic digital and analog fluidic devices and illustrates how they are used to develop a variety of functional networks. Jet wall-attachment and bean deflection elements are used for the discussion because of their predominant usage and ease of understanding. Example networks include the common binary counter and analog amplifier as well as more specialized networks for pulse-synchronization and heterodyning. Circuit performance and signal waveforms are illustrated.

Search terms: Fluidics; Logic devices; Network flow analysis; Circuit analysis; Jet amplifiers

HS-011 113 Fld. 5/4; 4/7

THE ADMITTANCE PROPERTIES OF A JET PROPORTIONAL AMPLIFIER

by Lael B. Taplin

Bendix Corp.

Published in HS-011 110, *Fluidics* (SP-348), New York, 1969 p27-35

2refs
Report no. SAE-690531

This paper discusses properties of a jet proportional amplifier, composed of a source jet, two opposing control jets, two receivers, and two or more venting ports. Data are presented on amplifier admittance properties and equivalent circuitry. Output characteristic curves were obtained for a jet proportional amplifier in good agreement with the model. Requirements for amplifier design are specified.

Search terms: Fluidics; Circuit analysis; Mathematical models; Jet amplifiers; Equations

HS-011 114 Fld. 5/4

GOODYEAR SUPER-CUSHION AIR SPRINGS

Goodyear Tire and Rubber Co.

1971 54p

This catalog introduces air springs, describes various types and their applications, and provides general guidance and data for designers. Most of the manual gives performance data such as load/deflection curves, dynamic characteristics, and drawings.

Search terms: Air suspension systems; Vibration; Spring design; Frequencies; Performance characteristics; Load bearing capacity; Engineering Drawings; Deflection

HS-011 115 Fld. 5/4

BONDED JOINTS: DESIGN CONSIDERATIONS AND ARMY APPLICATIONS

by A. T. Devine

Picatinny Arsenal

1972 7p 5refs
Report no. SAE-720119

Presented at the Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Ten points are offered as essential to good adhesive joint design. Examples of the role of adhesives in current Army hardware such as the LAW and Shillelagh antitank missiles and the Airmobile Aircraft Maintenance Shop are discussed. Training requirements are outlined for personnel who are to bond munitions with adhesives, and examples of process controls for production line assembly are given.

Search terms: Joints; Adhesives; Bonding; Reliability; Manufacturing

AVAILABILITY: SAE

HS-011 116 Fld. 5/4

ON THE RISE: ENGINE TEMPERATURES AND SILICONE RUBBER PROPERTIES

by T. J. Gair; W. W. Wadsworth

General Electric Co.

1972 4p
Report no. SAE-720129

Presented at the Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

This paper shows that the rise in engine temperatures of automobiles has created a need for elastomers which can resist the deleterious effects of the higher heat. In addition to the high temperature requirement, a material with high tear and high modulus was also needed, as it is anticipated that there will be an increased use of silicone rubber fabricated parts. It is also pointed out that silicones have continued to improve their physical properties so that they are now being used in many automotive applications, and will be the answer to many design problems confronting the industry today. It is further predicted that there will be a need of silicone rubber adhesive/sealants to replace performed gaskets and as bonding agents for trim and automotive ornaments.

Search terms: Seals; Rubber gaskets; Silicone rubbers; Physical properties; High temperature; Heat resistance

AVAILABILITY: SAE

HS-011 117 Fld. 5/4

MOLDED URETHANE FOAM FOR AUTOMOTIVE SEATING

by L. M. Zwolinski

Allied Chemical Corp.

1972 6p 13refs
Report no. SAE-720130

Presented at the Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Comfort, styling, and durability of automotive seating is largely due to the excellent performance of flexible urethane foam cushioning elements. This paper reviews the production and properties of current molded urethane foam cushioning, and the total assembly seating performance requirements. The newer developments of "full-depth" cushioning and "high-resilience" foams are examined in some detail.

Search terms: Seat design; Seat cushions; Comfort; Polyurethane foams; Molding; Physical properties; Manufacturing; Automobile materials

AVAILABILITY: SAE

HS-011 118 Fld. 5/4

IMPACT TESTING OF HIGH-DENSITY SEMIRIGID URETHANE FOAM FOR AUTOMOTIVE BUMPER APPLICATIONS

5/4 Design (Cont'd.)

HS-011 118 (Cont'd.)

by Frank J. Limbert; William J. Persin

Mobay Chemical Co.

1972 10p 5refs
Report no. SAE-720132

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Semirigid urethane-foam specimens of various high densities were evaluated when subjected to simulated heavy impacts such as in low-speed automobile collisions. The dynamic test results showed excellent material-energy absorption with essentially no compression sets, even after many repeated impacts of high deflection. These findings, coupled together with the well-known tough physical properties of urethanes, provide an outstanding candidate material that can be used to effectively reduce the damage to support structures and contact surfaces, not only in automotive applications but in any other application requiring a reduction of shock forces.

Search terms: Materials tests; Urethane bumpers; Impact tests; Energy absorbing bumpers; Rigidity; Density; Dynamic tests; Displacement; Foams; Mathematical analysis; Physical properties

AVAILABILITY: SAE

HS-011 119 Fld. 5/4

EFFECTS OF TRANSMISSION FLUID ON CLUTCH PERFORMANCE

by C. W. Schade

General Motors Corp.

1971 10p
Report no. SAE-710734

Presented at the National Farm, Construction and Industrial Machinery Meeting, Milwaukee, 13-16 Sep 1971.

Several experiments designed to study fluid flow through a rotating clutch were conducted. Fluid flow between a rotating grooved plate and a glass reaction plate was photographed. Viscous drag as a function of groove pattern was developed. Interface temperature as a function of flow was determined at various energy levels. From this information, a general discussion is presented which shows that the static and dynamic coefficients of clutch friction can be altered by changing the fluid composition. It is then shown that as fluid properties must be considered in the design of automatic transmissions and their components, the transmission user must follow the manufacturer's fluid recommendation if optimum transmission performance is to be achieved.

Search terms: Clutches; Transmission fluids; Fluid flow; Coefficient of friction; Lubricants; Coolants; Grooving; Drag; Clutch plates; Specular reflection

AVAILABILITY: SAE

HS-011 120 Fld. 5/4

REDUCTION OF NOISE EMISSIONS FROM DIESEL ENGINE SURFACES

by M. F. Russell

C. A. V. Ltd. (England)

1972 12p 4refs
Report no. SAE-720135

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

One of the effects of the existing and proposed European legislation limiting vehicle noise has been to generate a requirement for quieter engines. A simple analysis of the vibration of the external surfaces of several in-line engine structures has shown how the noise from the engine surfaces can be reduced, provided that all the thin-section areas of the external surface are treated. Noise-reduction techniques have been evolved for all the commonly used surface structures for diesel engines, and these are described in this paper. Four in-line diesel engines have been treated by these techniques, and noise reductions of 5-8 dBA have been obtained. In all cases, the same manufacturing plant was used to machine the modified crankcase/cylinder block casting; the valve gear cover and sump were modified versions of those already fitted to the engine.

Search terms: Engine noise; Diesel engines; Noise standards; Noise control; Engine modification; Engine design; European vehicles; Engine operating conditions; Crankcases; Damping; Mathematical models; Vibration analysis

AVAILABILITY: SAE

HS-011 121 Fld. 5/4; 5/11

BUMPERS: A NEW SYSTEM OF SERVICE

by Tony Grey

Published in *Motor Age* v90 n10 p52-55 (Oct 1971)

New bumpers are being introduced in the 1972 car models; they are stronger and placed further from sheet metal. Some absorb energy, and many have rubber strips or inserts. Designs are illustrated and maintenance tips given. Number of parts, weight, and costs have risen sharply, though straightening and reusing damaged parts may save money. In some instances, components of the bumper assembly may be replaced and so eliminate the need for complete bumper replacement.

Search terms: Bumper design; Automobile models; Automobile repair costs; Energy absorbing front structures

HS-011 122 Fld. 5/4; 5/6

USA '70

by Roger Huntington

Published in *Autocar* v131 n3842 p10-3 (Oct 1969)

New developments and modifications on 1970 model cars include: steering locks and reduced emissions required, bigger engines with lower rear-axle ratios, intermediate size cars, medium priced "personal" cars, engine innovations, new frame body construction, improved disc brakes, standardized "industry" bias-belted tires, and various small component improvements.

Search terms: Automobile models; Automobile design; Automobile safety standards; Exhaust emission control; Automobile dimensions; Engine design; Bias belted tires

HS-011 123 Fld. 5/4

TESTING. . .TESTING. . .HOW WE DO IT; WHY WE DO IT; WHAT IT MEANS

Anonymous

Published in *Car Life* v16 n10 p73-5 (Nov 1969)

Car Life magazine's road-test procedures to be used for the 1970 models are briefly described. Test results are tabulated for 60 models tested in 1968-69, including basic specifications, one-fourth mile acceleration, top speed, braking, and fuel economy.

Search terms: Automobile tests; Road tests; Test equipment; Automobile performance

5/6 Fuel Systems

HS-011 124 Fld. 5/6; 5/4

INFLUENCE OF LOW LEAD FUELS ON EXHAUST VALVE PERFORMANCE

by William S. Giles; Stanley H. Updike

TRW, Inc.

1971 11p 3refs
Report no. SAE-710674

Presented at the SAE National West Coast Meeting, Vancouver, 16-19 Aug 1971.

An extensive series of tests has been completed to evaluate accelerated exhaust valve seat wear which occurs in passenger car engines with lead-free gasoline. Results indicate that the predominate factor contributing to seat recession is vibration induced relative motion between the valve and seat. Engine speed rather than load or temperature showed the greatest influence on accelerated wear. Various combinations of valve head shape including changes in seat angle, seat width, and valve head stiffness were studied. Fixed versus rotated valves, various valve materials, and face coatings and fuel additive evaluations also were made. Reduced valve seat angles and hardened seats showed the greatest reduction in valve seat wear with lead-free gasoline.

Search terms: Exhaust valve wear; Lead free gasoline; Vibration; Engine speeds; Exhaust valve design; Rotary valves; Coatings; Fuel additives

AVAILABILITY: SAE

HS-011 125 Fld. 5/6

TIME-RESOLVED MEASUREMENTS OF HYDROCARBON MASS FLOWRATE IN THE EXHAUST OF A SPARK-IGNITION ENGINE

by Rodney J. Tabaczynski; John B. Heywood; James C. Keck

Massachusetts Inst. of Tech.

1972 14p 8refs
Report no. SAE-720112

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Experimental measurements of the instantaneous exhaust gas temperature, mass flowrate, and hydrocarbon concentration have been made in the exhaust of a single cylinder research engine. The temperature measurements were accomplished using an infrared optical technique and observing the radiation of the exhaust gas at the 4.4 μm band of CO_2. Instantaneous exhaust gas mass flowrates were monitored by placing a restriction in the exhaust manifold and measuring the instantaneous pressures across the restriction. Time-resolved hydrocarbon concentrations were measured using a fast-acting sampling valve with an open time of 2 ms. From these measurements, the hydrocarbon mass flowrate is calculated as a function of crank angle. The hydrocarbon mass flowrate calculations show that approximately 40% of the hydrocarbons leave the cylinder early in the exhaust process, due to the exit of the head quench layer, and 50% leave the cylinder near the end of the exhaust process, due to the exit of a hydrocarbon-rich vortex produced by the upward motion of the piston. The remainder of the hydrocarbons leave in the middle of the exhaust stroke. The measurements explain why a reduction of the quench volume, created by the clearance between the piston and the first compression ring, reduces average hydrocarbon concentrations.

Search terms: Exhaust gases; Hydrocarbons; Spark ignition engines; Exhaust manifolds; Exhaust pressure; Flow; Infrared analyzers; Exhaust emissions sampling; Quenching; Operating temperature; Single cylinder engines; Engine operating conditions; Time factors; Mathematical analysis;

5/6 Fuel Systems (Cont'd.)

HS-011 125 (Cont'd.)

Engine speeds; Valve timing; Cylinder pressure

AVAILABILITY: SAE

HS-011 126 Fld. 5/6

EMISSIONS FROM A DIRECT-CYLINDER WATER-INJECTED SPARK-IGNITION ENGINE

by S. S. Lestz; W. E. Meyer; C. M. Colony

Pennsylvania State Univ.; Imbt (Herbert R.), Inc.

1972 8p 10refs
Report no. SAE-720113

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

The gas-phase exhaust emissions which resulted when a variably timed, variable mass of water was injected directly into the cylinder of a spark-ignition engine are reported. The experimental setup and the procedure used in the investigation are also described. Conclusions are drawn with regard to the otpimum injection timing and amount of water introduced. Generally, direct-cylinder injection of water reduces NO, increases unburned HC, and does not effect CO and CO_2. For a fixed-ignition timing, power also deteriorates. Another finding of this investigation is that direct-cylinder injection does result in NO reductions of better than 85% while using about one-third the mass of water required by manifold injection to effect a similar reduction.

Search terms: Spark ignition engines; Water injection; Injection timing; Exhaust gases; Hydrocarbons; Nitrogen oxides; Carbon monoxide; Exhaust emission control; Engine operating conditions; Exhaust emissions sampling; Single cylinder engines

AVAILABILITY: SAE

HS-011 127 Fld. 5/6

NEW ASPECTS OF PREIGNITION IN EUROPEAN AUTOMOTIVE ENGINES

by J. C. Guibet; A. Duval

Institut Francais du Petrole; Elf-Enterprise de Rech. et d'Act. Petrol. (France)

1972 20p 15refs
Report no. SAE-720114

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Research has been done on preignition in automotive engines using a new experimental method enabling the phenomenon to be followed from its onset to its final phase. The technique consists of interrupting conventional spark ignition for a brief period and detecting any uncontrolled ignition signal at no matter what instant in the cycle it may occur. With regard to the danger of preignition, it was demonstrated that fuel effect depends on the following two properties: specific resistance to hot-point ignition and capacity to heat up a possible ignition source. The latter characteristic is linked to both combustion speed and fuel flame temperature. The source of preignition is usually the exhaust valve covered with mineral deposits coming from fuel and lubricant additives. The most harmful deposits are made of barium and calcium phosphates coming from detergent additives in lubricants; whereas lead compounds coming from antiknock additives in fuels have no appreciable effect. The effect of thermal parameters concerning engine design and operating conditions was also examined. The most effective way to control preignition is to decrease the harmful influence of metallic lubrican
additives on exhaust valve deposi
properties.

Search terms: Preignition; Spark ignition engines; Engine operating conditions; Flame temperature; Fuel additives; Lubricant additives; Thermal factors; Engine design; Exhaust valves; Engine deposits; European vehicles; Combustion; Heat resistance; Barium; Calcium; Lead; Ignition temperature, Thermodynamic properties; Hydrocarbons; Engine speeds; Mineral deposits; Tetraethyl lead; Phosphates

AVAILABILITY: SAE

HS-011 128 Fld. 5/6

MEASUREMENT OF INDUCTIO
GAS VELOCITIES IN A RECI
PROCATING ENGINE CYLIN
DER

by M. J. Arnold; M. J. Tindal; T. J
Williams

London Univ. (England)

1972 10p 8refs
Report no. SAE-720115

Presented at Automotive Engineerin
Congress, Detroit, 10-14 Jan 1972.

Instantaneous gas velocities inside th
combustion chamber, cylinder and inle
port of a motored 4-stroke engine hav
been determined using a constant
temperature hot wire anemometer. Th
measurements were made with bot
stationary and moving probes, the latte
being operated by means of a traversin
mechanism driven from the piston of a
adjoining cylinder. With the movin
probes, it was possible to study the flo
close to the piston crown throughout th
induction stroke. The probes wer
calibrated in a steady gas stream an
their response checked under transien
conditions using a shock tube. Cylind
gas flow readings were obtained at tw
speeds of rotation of the engine and

masked inlet valve was used to create varying degrees of induction swirl.

Search terms: Reciprocating engines; Combustion chambers; Combustion rate; Anemometers; Engine speeds; Combustion chamber swirl; Cylinder gases; Cylinders; Pistons; Gas motion; Engine operating conditions; Measuring instruments; Cylinder heads; Calibration; Velocity; Flow

AVAILABILITY: SAE

HS-011 129 Fld. 5/6

EXHAUST RECIRCULATION AND SPARK CONTROL—A SPEED GOVERNED AND VACUUM

by E. J. Martin; D. R. Vance

Dana Corp.

1972 11p 3refs
Report no. SAE-720123

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Published test results have established that the recirculation of a portion of an engine's exhaust gas is an effective means of reducing oxides of nitrogen in the exhaust. Many methods of flow control have been tried; some require extensive revisions to the carburetion system. A retrofit system in which recirculation and spark advance are selectively controlled by vehicle speed and vacuum level has been tested on various cars to give 30-70% reductions in NO_x as well as significant reductions in HC and CO. Revisions to the existing power train are minimal, while changes in driveability and fuel economy are hardly noticeable.

Search terms: Nitrogen oxides; Exhaust gas recirculation; Hydrocarbons; Carbon monoxide; Power trains; Driveability; Fuel economy; Exhaust emission control devices; Carburetors; Spark timing; Fuel flow; Modulators; Used automobiles; Engine operating conditions; Exhaust emission standards; Engine speeds

AVAILABILITY: SAE

HS-011 130 Fld. 5/6

EFFECT OF LABORATORY AMBIENT CONDITIONS ON EXHAUST EMISSIONS

by M. J. Manos; J. W. Bozek; T. A. Huls

Scott Res. Labs., Inc.; Environmental Protection Agency

12p 8refs
Report no. SAE-720124

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

A program was conducted to determine the effect of temperature and humidity on exhaust emissions from automotive engines. The objective was to determine if the effects were of sufficient magnitude to require the application of correction factors to measured exhaust emissions to standard humidity and temperature values. Both American and foreign-made vehicles were tested at 20 combinations of ambient temperature and humidity. The effect of temperature and humidity was found to be both unpredictable and of little significance for hydrocarbon and carbon monoxide emissions. No correction factors were developed for these exhaust gas constituents. The effect of temperature was found to be of little significance for oxides of nitrogen. However, humidity effects were found to be significant and predictable for oxides of nitrogen. A correction factor was developed to correct oxides of nitrogen to a standard humidity value and was subsequently incorporated into the federal test procedure for determining automotive exhaust emissions.

Search terms: Laboratory tests; Ambient temperatures; Exhaust emission tests; Humidity; Exhaust gases; Hydrocarbons; Carbon monoxide; Nitrogen oxides; Linear regression analysis; Regression analysis; Exhaust emissions sampling

AVAILABILITY: SAE

HS-011 131 Fld. 5/6

CARBON DIOXIDE (CO_2) TRACER TECHNIQUE FOR MODAL MASS EXHAUST EMISSION MEASUREMENT

by Ward W. Wiers; Charles E. Scheffler

General Motors Corp.

1972 15p 6refs
Report no. SAE-720126

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

The CO_2 tracer technique is a method of measuring automotive exhaust mass emissions during arbitrary modes of operation of a car on the 1972 federal emission test driving schedule. This technique allows modal mass measurements of low-emission cars based on undiluted exhaust gas concentrations. The CO_2 concentration at the tailpipe is compared with the CO_2 in the diluted stream to obtain exhaust flow. This flow, multiplied by tailpipe concentrations of hydrocarbon, carbon monoxide, and nitric oxide, and integrated over the driving mode, gives modal mass emissions. Problems associated with the lag between the time at which a transient maneuver takes place in the engine and the time at which measurements are recorded are also discussed.

Search terms: Carbon dioxide; Exhaust gases; Hydrocarbons; Carbon monoxide; Nitric oxide; Exhaust emissions measurement; Exhaust emission tests; Time factors; Exhaust

5/6 Fuel Systems (Cont'd.)

HS-011 131 (Cont'd.)

emissions sampling; Measuring instruments; Radioactive tracers

AVAILABILITY: SAE

HS-011 132 Fld. 5/6

PROCEDURES FOR DETERMINING EXHAUST CARBONYLS AS 2, 4-DINITROPHENYLHYDRAZONES, PARTS 1 AND 2

Bureau of Mines

1971 42p 7refs
Report no. PB-200 883; CRC-APRAC-CAPE-11-68-2

Sponsored by the Coordinating Res. Council, Inc.

A gas chromatography method was developed for determining individual and total carbonyls (such as aldehydes and ketones) in exhaust gas. Results were in good agreement with the colorimetric method. The gravimetric method gave erroneously high values.

Search terms: Exhaust emission measurement; Carbonyls; Aldehydes; Ketones; Gas chromatography; Chemical analysis; Colorimetry; Exhaust gases; Exhaust composition

AVAILABILITY: NTIS as PB-200 883

HS-011 133 Fld. 5/6

OXYGENATES IN AUTOMOTIVE EXHAUST GAS: PART 3. CARBONYLS AND NON-CARBONYLS IN EXHAUSTS FROM SIMPLE HYDROCARBON FUELS. FINAL REPORT

Bureau of Mines

1970 23p 6refs
Report no. CRC-CAPE-11-68-3; PB 200 884

Sponsored by the Coordinating Res. Council, Inc.

Procedures were developed for analysis of oxygenated hydrocarbons in exhaust gas, following concentration and two-stage chromatographic separation from hydrocarbons. Oxygenates were identified by mass spectrometry and gas chromatography retention times. Analysis of heavy carbonyls was improved through conversion to oxime derivatives. Among noncarbonyl oxygenates, phenols and nitromethane were most abundant.

Search terms: Exhaust emissions measurement; Carbonyls; Gas analysis; Hydrocarbons; Mass spectrometry; Fuels; Chromatography; Phenols; Exhaust gases; Exhaust composition; Gas chromatography; Exhaust emissions sampling

AVAILABILITY: NTIS as PB-200 884

HS-011 134 Fld. 5/6

REDUCING EXHAUST EMISSIONS FROM DIESELS

Anonymous

Published in *Automobile Engineer* v61 n9 p16, 21-2 (Sep 1971)

Diesel emissions are intrinsically low in hydrocarbons and carbon monoxide, but nitrogen oxide levels are similar to gasoline engines. California proposes to limit diesel emissions and federal regulation seems likely. Most engines will be able to meet standards proposed for 1973, but not for 1975. Tests on several types of diesels indicate that NO_x levels must be reduced drastically. Retarded injection timing, water injection, and exhaust recirculation are effective, particularly with precombustion chambers.

Search terms: Precombustion chamber engines; Engine tests; Engine modification; Exhaust emission control Nitrogen oxides; Diesel engine exhaust emissions; Exhaust emission standards Water injection; Injection timing Exhaust gas recirculation

5/14 Occupant Pretection

HS-011 135 Fld. 5/14

FACTORS ASSOCIATED WITH OBSERVED SAFETY BELT USE

by Leon S. Robertson; Brian O'Neill Charles W. Wixom

Insurance Inst. for Hwy. Safety

1972 23p 12refs

Prepublication copy. To be published in *Journal of Health and Social Behavior* Mar. 1972.

Death and injury in motor vehicle crashes can be greatly reduced by the use of safety belts. Studies based on claimed use result in inflated estimates of use and questionable correlations with social and other factors. This study of visually observed driver's use or nonuse of safety belts found education, comfort and convenience ratings of safety belts. having had a friend injured in a crash. and not smoking while driving to be additively associated with safety belt use. Ratings of self while driving, or persons who use belts, and estimates of friends use were associated with safety belt use; but these three associations did not hold if education were held constant.

Search terms: Seat belt usage; Seat belt design; Driver motivation Comfort; Driver educational levels Seat belt statistics; Smoking

5/15 Propulsion Systems

HS-011 136 Fld. 5/15

DUAL SCR CHOPPER AS A MOTOR CONTROLLER FOR AN ELECTRIC CAR

by Wally E. Rippel

Published in *IEEE Transactions on Vehicular Technology* vVT-20 n2 p23-6 (May 1971)

Despite recent advances in solid state controls for electric cars, chopper induced problems still exist. Commutation and AC losses are significantly high; the chopping action induces losses within the power source; and large ripple components in the chopper output cause increased RMS losses at the motor. Two conventional choppers in parallel reduce these problems. The duty cycle generated by the firing circuit is feedback controlled so that the load current remains proportional to control output. The dual chopper operates in a three-in-one system. In the first mode, the batteries charge at high rates; the second mode controls the amount of power flowing from battery to motor; and in the third or regenerative braking mode, the chopper transfers energy from the motor to the battery.

Search terms: Regenerative braking; Electric automobiles; Power loss; Power output; Battery charging; Energy consumption; Control equipment

HS-011 137 5/15; 5/4

THE DESIGN AND DEVELOPMENT OF A THIRD-GENERATION ELECTRIC HIGHWAY VEHICLE

by Wayne E. Goldman

Anderson Power Products

1972 8p
Report no. SAE-720110

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

In September 1971, Anderson Power Products decided to design an electric highway vehicle scheduled for production by July 1972. The production design was based on two previous prototype vehicles. All the vehicles were original designs based on the unique requirements of battery-powered systems. This paper discusses a systems concept for electric vehicles, the design and evolution of a third-generation vehicle, and the support equipment necessary for successful vehicle operation and maintenance.

Search terms: Electric vehicles; Vehicle design; Experimental vehicles; Battery charging

AVAILABILITY: SAE

HS-011 138 Fld. 5/15

ELECTRIC CAR DRIVES—DESIGN CONSIDERATIONS

by Baruch Berman; George H. Gelb

TRW Systems Group

1972 24p 51refs
Report no. SAE-720111

Presented at the Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

Proper selection of the traction drive system to meet the requirements of an electric passenger vehicle is of prime importance. Choice may be made among alternating current (AC), direct current (DC), or combined systems. Each approach can be implemented by utilizing various control techniques and power elements. An AC system may use an adjustable voltage inverter (AVI) or a pulse-width-modulated inverter (PWMI) for the power processor; and an induction motor or a synchronous motor for the rotating element. Similar alternatives exist for a DC system. Various AC and DC techniques are described. AVI, PWM, and representative DC chopper power processors are explained, and their interface with a variety of motors is examined. A review of characteristics relating to electric car requirements is made in an attempt to orient the designer and user with information necessary for selection of drives.

Search terms: Alternating current drive systems; Electric automobiles; Traction; Inverters; Direct current drive systems; Control equipment; Torque; Direct current motors; Engine design

AVAILABILITY: SAE

5/18 Steering Control System

HS-011 139 Fld. 5/18; 4/7; 5/22

SKID-STEERING. PT. 3. COMPARISON OF TRACKED AND WHEELED VEHICLES, DETERMINATION OF POWER INPUTS AND DEVIATIONS FROM THE THEORY

by K. R. Weiss

Published in *Automobile Engineer* v61 n9 p36-9 (Sep 1971)

4refs

Existing theories are extended to compare tracked and wheeled vehicles, determine steering power inputs, and describe deviations from theory. Difficulties of predicting and measuring skid steering effects on soft soil are mentioned and effect of tire construction evaluated.

Search terms: Tracked vehicles; Vehicle dynamics; Steering; Tire soil interface; Tire traction; Equations; Skid control; Tire characteristics; Steering force; Wheel performance

HS-011 140 Fld. 5/18

SUSPENSION MODIFICATIONS

Anonymous

Published in *Air Force Driver* v3 n6 p1-5 (Nov 1969)

Suspension modifications on street-driven cars can be dangerous, say factory engineers who guide their companies' stock car racing. Reversed wheels destroy front end alignment, lead to poor handling, suspension strains, and tire wear. Alloy wheels are prone to cracking and failure under rough road stresses. Jacked-up suspensions cause bad handling, wandering, tire wear, and very bad cornering characteristics. Safe drag-strip changes and aids to handling are described: wide tires on heavy duty rims, traction bars, stiff shock absorbers, and antisway bars.

Search terms: Suspension systems; Automobile modification; Vehicle stability; Vehicle handling; Drag racing; Racing automobiles

5/22 Wheel Systems

HS-011 141 Fld. 5/22

AN AUTOMATIC METHOD FOR IDENTIFICATION OF DYNAMIC PROPERTIES OF RUBBER

by R. E. Goodson; B. M. Hillberry; A. S. Paul

Purdue Univ.; General Motors Proving Ground

1972 8p 8refs
Report no. SAE-720131

Presented at Automotive Engineering Congress, Detroit, 10-14 Jan 1972.

A new method for determining the spring and damping constants for elastomer materials is presented. The method relies on three concepts—measurement of force and displacement or velocity across the test specimen, precise control of differential phase shift and sensitivity in transducers and electronics over the full operating frequency and amplitude range, and automatic optimal identification of K and C using analog hardware. The technique may be used in conjunction with either a resonant beam or electrohydraulic system, as demonstrated in the paper. Typical error sources are presented for both systems with indications given of their elimination by the new technique. Hardware implementing the concepts is described and calibration test results given. It is concluded that the system provides an automatic test procedure which has the potential to reduce errors and maintain consistent results for rubber properties, relatively independent of the test machines and operators.

Search terms: Elastomers; Errors; Rubber; Test equipment; Dyanmic tests; Analog computers; Computerized test methods; Damping; Spring rates; Resonant frequency; Mathematical analysis; Displacement; Force; Phase diagrams; Transducers; Electronic devices; Calibration; Properties

AVAILABILITY: SAE

HS-011 142 Fld. 5/22

RADIAL TYRES ON TEST

Anonymous

Published in *Autocar* v135 n3937 p4-8 (9 Sep 1971)

Fourteen makes of radial-ply tires were compared at Silverstone track on a car with fairly neutral steering, a Ford Mexico. Dry road braking was measured, handling assessed through many quick turns, steering effort measured, and ride comfort evaluated. An outstanding tire for handling was only moderate for braking and traction—typical of design compromises. Using a high-performance car, a specially tuned Marina 1.8 with one make of tire, the effects of tire size, profile, rim width, and inflation pressure were tested.

Search terms: Road tests; Tire tests; Tire performance; Radial tires; Vehicle handling; Great Britain; Tire sizes; Tire inflation pressure; Rim widths; Tire characteristics; Comfort; Tire riding characteristics

HS-011 143 Fld. 5/22; 2/7

EFFECTIVENESS OF STUDDED TIRES

by Robert W. Smith; W. E. Ewens; Donald J. Clough

Published in *Highway Research Record* n352 p39-49 (1971)

5refs

Presented at the 50th Annual Meeting of the Highway Research Board and sponsored by the Task Force on Effect of Studded Tires.

Locked wheel stopping distances in identical cars with highway tread tires on four wheels, with snow tires on the rear wheels, with studded snow tires on the rear wheels, and with studded snow tires on four wheels were tested at speeds up to 50 mph and at temperatures from -5 to 33°F. On glare ice, snow tires gave no consistent improvement in stopping distance, compared with standard highway tires. Studded snow tires on rear wheels reduced stopping distance somewhat; used on all four wheels, considerably more; improvement was greatest at ice temperatures near the freezing point. All treads had similar stopping distances on asphalt. On concrete, studded tires increased stopping distances slightly, particularly on wet roads at high speeds.

Search terms: Stopping distance; Tire skid resistance; Studded tires; Icy road conditions; Wet road conditions; Dry road conditions; Canada; Snow tires; Asphalt pavements; Concrete pavements

HS-011 144 Fld. 5/22; 1/5; 1/3

INFLUENCE OF STUDDED TIRES ON WINTER DRIVING SAFETY IN QUEBEC

by Jean Normand

Published in *Highway Research Record* n352 p50-61 (1971)

11refs

Presented at the 50th Annual Meeting of the Highway Research Board and sponsored by the Task Force on Effect of Studded Tires.

Police reports and motorist questionnaires were used to examine Quebec accident data for the winter of 1969-70 with regard to the use or non-use of studded tires. An analysis of the classification of the accidents show that an improvement of safety related to the use of studded tires, if any, is inferior to the precision of the data. Answers to the questions also indicate that the use of studded tires does not seem to have improved the accident record of persons using studded tires. Preliminary results of a parallel study in Minnesota are given. No consistent difference in accident rate or severity was established.

Search terms: Skidding accidents; Accident rates; Winter driving; Studded tires; Surveys; Minnesota; Quebec; Winter accidents; Police reports; Accident statistics

NHTSA DOCUMENTS

NHTSA Accident Investigation Reports

HS-600 776 Fld. 1/5

MULTIDISCIPLINARY ACCIDENT INVESTIGATION SUMMARIES. VOL. 3, NO. 2

National Hwy. Traf. Safety Administration

1972 263p

In-depth studies of highway crashes are being conducted to identify contributing factors in automobile crashes; identify injury causation; evaluate the effectiveness of countermeasures; and provide early detection of design and functional problems of the vehicle and the highway. Summaries of 50 case reports are given.

Search terms: Accident analysis; Accident investigation; Multidisciplinary teams; Accident studies; Accident case reports; Injury causes; Accident factors; Vehicle design; Precrash phase; Crash phase; Postcrash phase; Accident causes; Accident types; Time of accidents; Environmental factors; Highway design; Accident location; Damage severity; Injury severity; Accident prevention; Injury factors; Accident reconstruction

AVAILABILITY: NTIS

NHTSA Contractors Reports

HS-800 566 Fld. 5/21; 5/9

VEHICLE-IN-USE SAFETY STANDARDS STUDY. ALL VEHICLES. FINAL REPORT

by Fisher; Eidemiller; Biche

Ultrasystems, Inc.

1971 474p
Contract FH-11-7525
Report no. US-81202-2

The in-use condition of automobiles on the highway was studied. One primary objective was to assess the condition of vehicles in states having periodic motor vehicle inspection as compared with states having random inspection. Pennsylvania, New Jersey, and Washington, D. C. were used as the PMVI areas and California as the random inspection area. Data were collected from diagnostic centers and criteria developed for the selection of the centers. Component test criteria were developed for evaluating tested components as being in a pass or defective condition. It is concluded that the condition of vehicles in the three states having periodic motor vehicle inspection was significantly better than in the state with only random inspection.

Search terms: Vehicle safety standards; Vehicle inspection; Inspection effectiveness; Used automobiles; Diagnostic centers; Pennsylvania; New Jersey; California; District of Columbia; Automobile defects; Data acquisition; Data processing; Vehicle age; Vehicle mileage

AVAILABILITY: NTIS

HS-800 568 Fld. 5/21; 5/9

VEHICLE-IN-USE SAFETY STANDARDS STUDY. ALL ULTRASYSTEMS. FINAL REPORT

by Fisher; Eidemiller; Biche

Ultrasystems, Inc.

1971 474p
Contract FH-11-7525
Report no. US-81202-2

The in-use condition of automobiles on the highway was studied. One primary objective was to assess the condition of vehicles in states having periodic motor vehicle inspection as compared with states having random inspection. Pennsylvania, New Jersey, and Washington, D. C. were used as the PMVI areas and California as the random inspection area. Data were collected from diagnostic centers and criteria developed for the selection of the centers. Component test

HS-800 568 (Cont'd.)

criteria were developed for evaluating tested components as being in a pass or defective condition. It is concluded that the condition of vehicles in the three states having periodic motor vehicle inspection was significantly better than in the state with only random inspection. This volume details defects in relation to vehicle age.

Vehicle safety standards; Vehicle inspection; Inspection effectiveness; Used automobiles; Diagnostic centers; Pennsylvania; New Jersey; California; District of Columbia; Automobile defects; Data acquisition; Data processing; Vehicle age; Vehicle mileage; Variance analysis

AVAILABILITY: NTIS

HS-800 569 Fld. 5/21; 5/9

VEHICLE-IN-USE SAFETY STANDARDS STUDY. NEW JERSEY/PENNSYLVANIA. FINAL REPORT

by Fisher; Eidemiller; Biche

Ultrasystems, Inc.

1971 464p
Contract FH-11-7525
Report no. US-81202-2

The in-use condition of automobiles on the highway was studied. One primary objective was to assess the condition of vehicles in states having periodic motor vehicle inspection as compared with states having random inspection. Pennsylvania, New Jersey, and Washington, D. C. were used as the PMVI areas and California as the random inspection area. Data were collected from diagnostic centers and criteria developed for the selection of the centers. Component test criteria were developed for evaluating tested components as being in a pass or defective condition. It is concluded that the condition of vehicles in the three states having periodic motor vehicle inspection was significantly better than in the state with only random inspection. This volume details the Pennsylvania and New Jersey data.

Search terms: Vehicle safety standards; Vehicle inspection; Inspection effectiveness; Used automobiles; Diagnostic centers; Pennsylvania; New Jersey; California; District of Columbia; Automobile defects; Data acquisition; Data processing; Vehicle age; Vehicle mileage

AVAILABILITY: NTIS

HS-800 571 Fld. 5/21; 5/9

VEHICLE-IN-USE SAFETY STANDARDS STUDY. ACM FILE NO. 1. FINAL REPORT

by Fisher; Eidemiller; Biche

Ultrasystems, Inc.

1971 450p
Contract FH-11-7525
Report no. US-81202-2

The in-use condition of automobiles on the highway was studied. One primary objective was to assess the condition of vehicles in states having periodic motor vehicle inspection as compared with states having random inspection. Pennsylvania, New Jersey, and Washington, D. C. were used as the PMVI areas and California as the random inspection area. Data were collected from diagnostic centers and criteria developed for the selection of the centers. Component test criteria were developed for evaluating tested components as being in a pass or defective condition. It is concluded that the condition of vehicles in the three states having periodic motor vehicle inspection was significantly better than in the state with only random inspection. This volume presents data relating defects to vehicle age, mileage, make, and model.

Search terms: Vehicle safety standards; Vehicle inspection; Inspectio effectiveness; Used automobiles Diagnostic centers; Pennsylvania; Ne Jersey; California; District o Columbia; Automobile defects; Dat acquisition; Data processing; Vehicl age; Vehicle mileage; Automobil models

AVAILABILITY: NTIS

HS-800 572 Fld. 5/21; 5/9

VEHICLE-IN-USE SAFET STANDARDS STUDY. ACM FIL NO. 2. FINAL REPORT

by Fisher; Eidemiller; Biche

Ultrasystems, Inc.

1971 452p
Contract FH-11-7525
Report no. US-81202-2

The in-use condition of automobiles o the highway was studied. One primar objective was to assess the condition o vehicles in states having periodic moto vehicle inspection as compared wit states having random inspection. Pennsylvania, New Jersey, and Washington D. C. were used as the PMVI areas an California as the random inspection are Data were collected from diagnosti centers and criteria developed for th selection of the centers. Component tes criteria were developed for evaluatin tested components as being in a pass o defective condition. It is concluded tha the condition of vehicles in the thre states having periodic motor vehicl inspection was significantly better tha in the state with only random inspection. This volume presents data relatin defects to vehicle age, mileage, make and model.

Search terms: Vehicle safety standards; Vehicle inspection; Inspectio effectiveness; Used automobiles Diagnostic centers; Pennsylvania; Ne Jersey; California; District o Columbia; Automobile defects; Dat acquisition; Data processing; Vehicle age; Vehicle mileage; Automobile models

AVAILABILITY: NTIS

HS-800 615 Fld. 5/14

TEST FOR VEHICLE ROLLOVER PROCEDURE. FINAL REPORT

by Roger Young; Hugo Scheuerman

Federal Aviation Administration

1971 64p
Contract DOT-HS-032-1-036
Report no. PB-207 667; 171-1

Tests were performed using a number of different sizes and configurations of recent model motor vehicles to verify the rollover procedure called for in the occupant crash protection standard. The tests proved the adequacy of this procedure to produce repeatable rollovers and to demonstrate the applicability over a large range of vehicle sizes and configurations. Most of the vehicles tested carried anthropomorphic dummies. The test facility, a catapult and track assembly, is described.

Search terms: Rollover tests; Vehicle safety standards; Crashworthiness; Compliance tests; Anthropomorphic dummies; Test facilities; Impact sleds

AVAILABILITY: NTIS as PB-207 667

HS-800 622 Fld. 5/6; 5/15

DUAL-FUEL MOTOR VEHICLE SAFETY IMPACT TESTING. FINAL REPORT

by E. Enserink

Dynamic Science

1971 229p
Contract DOT-HS-046-1-062
Report no. 2310/20-72-1

Report for Mar-Nov 1971.

Impact tests were conducted to determine potential fire or other hazards resulting from rupture of fuel circuitry and/or tank retention failure in compressed natural gas and liquid natural gas systems. Five full-scale fixed barrier tests were conducted, four front end tests at 30 mph and one rear end test at 20 mph, with sedans and trucks. Ten sled tests were conducted on storage vessels and their attachment hardware. Both CNG and LNG vessels were drop tested onto a concrete surface. Analysis of the systems was conducted to determine if the normal occupant survivability limit of the vehicles in crash situations was adversely affected. Recommendations for improving the crashworthiness of the system were formulated. Except for one test, the natural gas systems tested in this program were relatively crashworthy. Relatively minor changes in the system would improve safety characteristics.

Search terms: Dual fuel vehicles; Compressed natural gas; Liquefied natural gas; Crashworthiness; Crashworthy fuel systems; Crashworthy fuel tanks; Barrier collision tests; Impact sleds; Drop tests; Head on impact tests; Rear end collisions; Fuel tank rupture; Fuel system failures; Accident survivability; Accident caused fires; Acceleration tolerances

AVAILABILITY: NTIS

HS-800 627 Fld. 1/5; 5/20

STATISTICAL ANALYSIS OF TRUCK ACCIDENT INVOLVEMENTS. FINAL REPORT

by R. E. Scott; J. O'Day

Michigan Univ. Hwy. Safety Res. Inst.

1971 147p
Contract FH-11-7614

This study of accidents involving large trucks is based primarily on police reports from the Indiana, Ohio, and Pennsylvania Turnpikes, six other accident files, and reports submitted to the Bureau of Motor Carrier Safety. Accident severity is greater when trucks are involved than when cars only are involved. The average number of fatalities in truck accidents is greater. In passenger car-truck collisions, the number of fatalities per passenger car is ten times greater than in collisions between cars only. Involvement rates in terms of accidents per mile of travel are about the same for cars and trucks according to turnpike accident files. A new measure of exposure, which incorporates parameters concerning the travel characteristics of both cars and trucks, was developed. By this measure, trucks on turnpikes are involved as the striking vehicle in rear end collisions more than twice as often as expected. Two factors stand out in the accident reports: the frequency with which truck drivers were asleep or fatigued and the frequency of vehicle defects.

Search terms: Truck accidents; Statistical analysis; Accident severity; Fatality rates; Vehicle mileage; Accident risk forecasting; Rear end collisions; Accident factors; Accident causes; Driver fatigue caused accidents; Sleep; Truck drivers; Truck defects; Accident statistics; Accident reports; Indiana; Ohio; Pennsylvania; Accident studies; Vehicle vehicle collisions; Vehicle size; Accident rates

AVAILABILITY: NTIS

HS-800 628 Fld. 5/1

A PROCEDURE FOR EVALUATING VEHICLE BRAKING PERFORMANCE. FINAL REPORT

by Ray W. Murphy

NHTSA Contractors Reports (Cont'd.)

HS-800 628 (Cont'd.)

Michigan Univ. Hwy. Safety Res. Inst.

1971 42p 10refs
Contract DOT-HS-031-1-051
Report no. HSRI-71-127

Braking efficiency is determined using a method whereby actual stopping distances achieved by the vehicle are compared to ideal stopping distances theoretically achievable if the vehicle brake system were able to modulate the brakes so that the tires produced peak braking forces throughout the stop. Test procedures are described for both vehicle and tire tests, along with the method employed for calculating ideal stopping distance. Results from tests and calculations are presented for two vehicles equipped with four-wheel antilock systems, which demonstrate that the method is viable and realistic. A means of comparing tire peak capability on a given surface to that produced by a standard tire is also discussed.

Search terms: Braking distance; Stopping distance; Braking forces; Brake tests; Tire tests; Antilocking devices; Tire brake force; Mathematical analysis; Coefficient of friction; Tire pavement interface; Tire slip motion; Wet road conditions; Dry road conditions; Tire loads; Tire force measurement

AVAILABILITY: NTIS

HS-800 629 Fld. 4/2; 5/14

AN EXPERIMENT IN THE USE OF BROADCAST MEDIA IN HIGHWAY SAFETY: SYSTEMATIC ANALYSIS OF THE EFFECT OF MASS MEDIA COMMUNICATION IN HIGHWAY SAFETY. FINAL REPORT

by Gerald A. Fleischer

University of Southern California

1971 139p 24refs
Contract DOT-HS-010-1-012

A radio/TV campaign was developed aimed toward improving the usage of safety belts. Messages were pretested by expert and lay panels, and the materials selected were broadcast to two demographically matched communities, Modesto and Salinas, California. Before, during, and after surveys of safety belt usage and attitudes about safety belts were conducted in these two cities and a control community, Bakersfield, California, where no safety belt related messages were broadcast. Resulting data were analyzed to determine the presence of significant differences in behavior and/or related attitudes. The primary goals of this study were: to determine the effect of traffic safety messages delivered through the broadcast media; to determine those factors inherent in a persuasive safety message campaign which are significant in determining effectiveness; and to relate incurred costs and resulting benefits. It was concluded that pubiic service announcements on the broadcast media cannot be considered an effective highway safety campaign technique.

Search terms: Seat belt usage; Seat belt campaigns; Radio communication; Television; California; Speed; Driver attitudes; Program evaluation; Interviews; Mass media

AVAILABILITY: NTIS

HS-800 647 Fld. 5/4

DEVELOPMENT OF A CRASHWORTHINESS TEST METHODOLOGY. PHASE 1. FINAL REPORT

by J. T. Herridge; R. K. Mitchell; R. D. Leis; G. A. Francis

Battelle Memorial Inst.

1971 175p 36refs
Contract FH-11-7550

Report for 26 Jun 1970-26 Jan 1971.

Prime and alternative methodologies are recommended for near-term development and utilization in testing the crashworthiness of experimental safety vehicle prototypes. A test methodology for the ESV can be structured using equipment and procedures drawn largely from the state of the art. Development of a new candidate methodology is not necessary. Instrumentation and types of tests are described.

Search terms: Safety cars; Crashworthiness; Impact tests; Barrier collision tests; Low speed impact tests; Rollover tests; Pole impact tests; Rear end collisions; Impact tolerances; Data acquisition; Data processing; Telemetry; Transducers; Electronic devices; Measuring instruments; Acceleration tolerances; Calibration; Photography

AVAILABILITY: NTIS

HS-800 649 Fld. 1/3

MULTIDISCIPLINARY ACCIDENT INVESTIGATIONS IN THE METROPOLITAN NEW ORLEANS AREA. FINAL REPORT

by Jack K. Wickstrom; C. Blase McCarthy

Tulane Univ.

1972 111p
Contract FH-11-7432

Report for Jan 1970-Jan 1971.

Twenty multidisciplinary accident investigations are described. The goals of the program are to determine accident causation, to identify injury causation, to evaluate automobile safety features, and to detect design and functional problems of the vehicle and highway.

Search terms: Accident analysis; Accident investigation; Multidisciplinary teams; Accident studies; Accident case reports; Injury causes; Accident factors; Vehicle design; Precrash phase; Crash phase; Postcrash phase; Accident causes; Accident types; Time of accidents; Environmental factors; Highway design; New Orleans; Accident location; Damage severity; Injury severity; Accident prevention; Injury factors; Accident reconstruction

AVAILABILITY: NTIS

HS-800 650 Fld. 1/3

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. VOL. 1. FINAL TECHNICAL REPORT.

by J. Robert Cromack

Southwest Research Inst.

1972 113p 37refs
Contract DOT-HS-024-1-115
Report no. 11-3075-Vol-1

Includes *Field Experience in Implementing the NATO Collision Analysis Report Form,* by J. Robert Cromack, and *Human/Psychological Factors in Multidisciplinary Accident Investigations,* by J. Robert Cromack and Thomas R. Williamson.

Eighty accident case studies are summarized. Comments are made regarding the effectiveness of current standards. Conclusions and recommendations are presented concerning driver education, driver licensing, public information, alcohol use, emergency medical service, motor vehicle inspection, motorcycle safety, recreational vehicles, highway design, construction, and maintenance, traffic control devices, police traffic services, debris removal, and wreckers. The most significant observation made by investigators was the extreme contribution of the human element in causing accidents and the apathy displayed by drivers and pedestrians toward highway safety.

Search terms: Accident investigation; Multidisciplinary teams; Accident case reports; Accident causes; Accident factors; Accident report forms; Precrash phase; Crash phase; Postcrash phase; Environmental factors; Safety program effectiveness; Safety standards; Driver education; Driver licensing; Alcohol usage; Public information programs; Emergency medical services; Vehicle inspection; Psychological factors; Accident severity; Driver characteristics; Driver personality; Drinking drivers; Driver intoxication; Sociological factors; Driver records; Flow charts; Human factors; Statistical analysis; Highway safety standards; Vehicle safety standards; Vehicle age; Vehicle characteristics; Accident location; Age factor in accidents; Fatalities; Accident types; Defective vehicles; Motorcycle safety; Recreational vehicles; Highway design; Highway construction; Highway maintenance; Police traffic services; Debris removal; Wreckers; Community support; Driver attitudes; Pedestrian safety; Driver vehicle road interfaces

AVAILABILITY: NTIS

HS-800 651 Fld. 1/3

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. VOL. 2. CASE SUMMARIES. FINAL REPORT

by J. Robert Cromack

Southwest Research Inst.

1972 418p
Contract DOT-HS-024-1-115
Report no. 11-3075-Vol-2

Eighty accident case studies are summarized. The purpose of the research is to define unknown factors concerning the road, the vehicle, and the human elements in accidents.

Search terms: Accident investigation; Multidisciplinary teams; Accident case reports; Accident causes; Accident factors; Precrash phase; Crash phase; Postcrash phase; Environmental factors; Psychological factors; Accident severity; Accident reconstruction; Human factors; Vehicle characteristics; Accident location; Accident types; Intersection collisions; Rear end collisions; Rear end collisions; Head on collisions; Rollover accidents; Ran off road accidents; Side impact collisions; Truck accidents; Vehicle vehicle collisions; Driver vehicle road interfaces

AVAILABILITY: NTIS

HS-800 655 Fld. 4/5

COMPUTER PROGRAM EFFECTIVENESS MODEL. FINAL REPORT

by S. B. White; C. A. Clayton; J. W. Dunn; A. C. Nelson

Research Triangle Inst.

1972 114p 46refs
Contract DOT-HS-022-1-177
Report no. 43U-670

A model has been developed for evaluating the effectiveness of existing or proposed highway safety programs and motor vehicle safety standards. A computer program was developed to perform the computations of effectiveness as formulated in the model. The computer program is described, including block diagrams, input requirements, limitations and constraints, and the flexibility of output format (sensitivity and simulation analyses). Numerical examples are given to illustrate the operational feasibility of the model as well as its flexibility in analyzing problems.

NHTSA Contractors Reports (Cont'd.)

HS-800 655 (Cont'd.)

Search terms: Model tests; Computerized simulation; Computer programs; Highway safety programs; Safety program effectiveness; Vehicle safety standards; Program evaluation; Mathematical models; Accident rates; Fatality rates; Alcohol usage deterrents; Accident risk forecasting; Accident factors; Flow charts; Vehicle mileage; Seat belt effectiveness; Precrash phase; Data processing

AVAILABILITY: NTIS

NHTSA Staff Speeches, Papers, etc.

HS-810 194 Fld. 2/0

THE BEAT OF LIFE

by Charles H. Hartman

National Hwy. Traf. Safety Administration

1972 13p

Presented at Michigan Safety Conference, Lansing, 20 Apr 1972.

Safety programs of the Department of Transportation are outlined. Highway safety programs particularly mentioned are development of the experimental safety vehicle and alcohol countermeasures. A plea is made for all to support the cause of highway safety.

Search terms: Speeches; Safety cars; Alcohol usage deterrents; Highway safety programs; Safety programs; Department of Transportation

AVAILABILITY: NHTSA

HS-810 195 Fld. 5/17

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION COMPLIANCE TEST CENTER

by Francis Armstrong

National Hwy. Traf. Safety Administration

1972 13p

Presented at the national meeting of the American Society of Civil Engineers, Cleveland, 28 Apr 1972.

This speech, designed to be presented with slides, details the problems and program objectives which generated the need for this type of a testing facility. The scope of the task of assuring compliance with federal standards is given: the number of applicable Federal Motor Vehicle Safety Standards and the number of test requirements for technical audit within each standard; the form, cost, and equipment requirements to perform each technical audit; and the universe of vehicles and replacement parts that must be monitored for compliance with applicable standards. It is recognized that so complex an item as an automobile cannot achieve "perfection in production." Three possible nominal design values and their resultant variations in degree of compliance illustrate the relationship between federal standards and the establishment of these values. Standards enforcement testing activities are briefly reviewed and total test results are tabulated.

Search terms: National Highway Traffic Safety Administration; Speeches; Safety standards compliance; Compliance tests; Federal role; Automotive industry; Vehicle safety standards

AVAILABILITY: NHTSA

ERRATUM

The following citation appeared in HSL 72-9 May 12, 1972 without proper source:

HS-010 885 Fld. 1/3; 3/4

COUNTERMEASURES IN TRAFFIC SAFETY: AN OVERVIEW

by Roger E. Hagen

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refs

There are two broad classifications of countermeasure techniques: those designed to modify the environment, and those that modify behavior. Environmental countermeasures include operator packaging, vehicle detection and information systems, road improvement, traffic control, pedestrian protection, enforcement, and inspection. Behavioral countermeasures include child training, mass media, and personal communication and group techniques. This chapter is concerned with these countermeasures as well as some general guidelines for the development and evaluation of countermeasure programs.

Search terms: Accident prevention; Injury prevention; Occupant protection; Vehicle visibility; Highway communication; Signal lamps; Electronic Route Guidance System; Crashworthiness; Driver behavior; Driver attitudes; Highway design; Safety design; Safety program effectiveness; Pedestrian safety; Vehicle inspection; Child safety education; Public information programs; Police traffic services

The correct source is: Published as chapter 2 in the book entitled." Injury Control in Traffic Safety," compiled by Norman W. Heimstra, Ph.D, and published by Charles C. Thomas, Springfield, Ill. 62703

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